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INTELLIGENCE REPORT

AN EVALUATION OF ALLIED (US and GVN) AIR ATTACKS AGAINST NORTH VIETNAM

DIRECTORATE OF INTELLIGENCE

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AN EVALUATION OF ALLIED (US AND GVN) AIR ATTACKS AGAINST NORTH VIETNAM*

This report presents an analysis of the air offensive -- Rolling Thunder -- conducted by the United States and the Government of Vietnam against North Vietnam (see the map, Figure 1**). Included are estimates of the probable casualties suffered by the civilian population of North Vietnam as a result of the air attacks.

1. The Rolling Thunder Program***

On 2 March 1965 the governments of the United States and South Vietnam launched the Rolling Thunder program, a systematic but restrained air offensive against selected military and economic targets in carefully delimited areas of North Vietnam.

The objectives of the Rolling Thunder are (a) To reduce the ability of North Vietnam to support the operations of Communist insurgent forces in Laos and South Vietnam; and (b) To increase progressively the level of damage in North Vietnam to the point where the will of the Hanoi regime to continue Pathet Lao and Viet Cong activities will be critically weakened and will ultimately cease.

The Rolling Thunder program over time has extended both the area and the frequency of air attacks on North Vietnam. But self-imposed restrictions have limited both the choice of targets and the areas to be bombed. The existence of large "sanctuary" areas has effectively insulated almost 80 percent of North Vietnam's limited modern industrial economy from air attack; these areas contain 75 percent of the nation's population. The present sanctuary area is demarked roughly by a line 30 miles from the China - North Vietnam border, and with minor exceptions -- principally lines of communication targets and SAM sites -- the area east of 105° 20'E and north of 20° 30'N. The present restrictions also specify that the areas within a 30-nautical mile (nm) radius around the city of Hanoi and a 10-nm radius around the city of Haiphong shall be exempt from air attack.

The Rolling Thunder program defines armed reconnaissance as an air mission flown with the primary purpose of attacking targets of opportunity† in specified areas or along specified routes and not for the purpose of attacking specific briefed targets. Armed reconnaissance sorties are also authorized for the following three additional missions:

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* The estimates and conclusions in this report represent the best judgment of this Directorate as of 7 November 1965.

** Inside back cover.

*** See Appendix A.

† Targets of opportunity are enemy material and facilities.

(a) Attacks against small prebriefed military targets not on the JCS list, followed by armed route reconnaissance.

(b) Restrikes against previously struck JCS-designated fixed targets, excluding locks and dams, located within the armed reconnaissance area, with the objective of maintaining them nonoperational.

(c) Attacks against possible SAM systems lying within Rolling Thunder armed reconnaissance areas.

In addition to the area restrictions outlined above, the Rolling Thunder program specifically directs that utmost caution will be exercised in attacking all targets to avoid the striking of populated areas.

Armed reconnaissance aircraft are authorized to attack the following installations within authorized geographical areas: rail lines, yards, and sidings; railroad rolling stock; railroad construction or repair; trucks, ferries, ferry approaches, fords, lighters, barges, radar sites, secondary bridges, pontoon bridges, pontoon construction sites; road repair equipment; bivouac and staging areas; SAM installations; antiaircraft artillery; recognized DRV naval craft which fire on our aircraft; small military installations such as barracks, trucks, vehicle parks; small airfields; supply depots; other targets of military significance; and JCS targets struck on previous Rolling Thunder programs.

A total of 35 Rolling Thunder programs (including those scheduled through 11 November) have been flown since the inception of the operation. The application of the program has changed dramatically since March 1965. The first strike -- Rolling Thunder 5 -- was a one-day strike on two fixed targets. Current Rolling Thunder programs now schedule upwards of 1,200 strikes in a 2-week period. Some of the operational highlights of the Rolling Thunder program are (a) the expansion in April 1965 of armed reconnaissance to include fixed military targets and increased area coverage; (b) in the July-September 1965 period the program extended armed reconnaissance missions to the northwestern areas of the DRV; (c) during the same period, sorties were authorized to strike SAM systems located within the authorized armed reconnaissance areas; and (d) in October, the authorization was given to attack the vital northeast lines of communications connecting North Vietnam and China.

The major trend noticeable in recent Rolling Thunder programs has been a marked reduction of effort against fixed targets and a greater reliance on armed reconnaissance missions. As of 1 November 1965, the Rolling Thunder program has flown 6,907 sorties against fixed targets and 12,336 armed reconnaissance sorties.

2. Estimates of Civilian Casualties*

The estimates of civilian casualties presented in this report generally are restricted to those civilians resident in structures located outside of the immediate target area and which have suffered damage as the result of an air attack. This applies particularly to the attacks on fixed targets. In the case of attacks from armed reconnaissance missions, estimates in this report include civilians both within and adjacent to the target area. Since the preponderance of sorties have been flown against military targets, the civilian population within the targeted area would, of course, generally be smaller than in the adjacent areas. Civilians within a targeted area would usually be directly engaged in providing service and support to the military installation. Their location within the target area dictates that they would suffer proportionately heavier casualties. According to the prestrike estimates provided to the JCS, civilian casualties within the target area would be about 242 persons. We believe this is a reasonably accurate first approximation. The prestrike estimates provided to the JCS also indicate that military casualties would exceed civilian casualties by a ratio of about 10 to 1.

The North Vietnamese government has consistently charged that the US/South Vietnamese air offensive is directly aimed at populated centers and nonmilitary targets. Although the regime has released no official figures on total civilian casualties, it implies that casualties are inordinately high.

A few North Vietnamese official statements give precise casualty figures for specific incidents. These claims total 722 casualties, of which 317 were killed and 239 were wounded.

The present study has subjected every available intelligence source to close scrutiny in order to produce an objective first approximation of the order of magnitude of civilian casualties. The results of this analysis and the methodologies used have been correlated when possible within existing time limitations with pre- and post-strike photography of areas bombed by US and South Vietnamese forces.

At least two major factors suggest that civilian casualties must be small. The first of these is the nature of the US/South Vietnamese air offensive itself, in terms of both the geographic area and the types of targets attacked. The air strikes on fixed targets have generally concentrated on an area that contains only an estimated 700,000 persons. If it were assumed that civilian casualties could be directly equated to roof cover damage outside the target itself, the maximum range of such casualties would be between 7,000 and 10,000.

* See Appendix B.

But this assumption cannot be supported by available evidence. Ample intelligence supports the fact that North Vietnamese cities have been partially evacuated. Furthermore, casualties to persons actually "at risk" have been sharply reduced by an effective civil defense program. There is substantial and authoritative evidence that North Vietnam has this type of civil defense, which includes (a) the evacuation to rural areas or daytime dispersal of substantial groups of urban populations, particularly older women and children; (b) the systematic development of shelter programs, principally fox-holes and trenches; and (c) the dividing of work and school hours to avoid large concentrations of workers and children during daylight hours.

[redacted] these measures have had thorough, extensive, and effective application throughout the country, particularly in the areas subjected to air attack.

In making an independent check on the probable level of casualties, the experience of Germany during 1943 proved particularly useful. This was a period when Allied forces were delivering primarily high explosive ordnance against German cities; it preceded the heavy incendiary raids and the blockbuster attacks. This pattern is somewhat similar to the North Vietnamese strikes, as is the fact that effective civil defense programs existed in both cases. An important difference, however, in the German experience is the fact that German cities during this period were subjected to area raids as well as precision strikes against military and industrial targets.

The problem of estimated casualties from armed reconnaissance strikes is much more difficult, apart from those armed reconnaissance missions which were reattacks on fixed targets, and hence appear on photographic coverage of urban areas and are accounted for elsewhere. In this report, average civilian population density in rural areas of North Vietnam has been related to weapons effectiveness. This admittedly gives only a crude first approximation which has been incorporated in this report as a minimum.

[redacted]

The results of this analysis show that the civilian casualties in North Vietnam are probably in the range of 3,900 to 5,400 persons. The casualties attributable to air attacks on fixed targets are 1,700 to 2,400 persons. Those attributed to armed reconnaissance are 2,200 to 3,000 persons.

[redacted]

The magnitude of these estimated casualties can be related to normal death rates in North Vietnam and to the civilian casualties inflicted on South Vietnamese citizens by the Viet Cong. The high range of this estimate is 1 to 2 percent of the normal death rate in North Vietnam. It also is between one-fourth and one-half of the number of North Vietnamese who are accident victims each year. The estimate of 3,900 to 5,400 casualties, if expressed arbitrarily as 50 percent killed, would represent about 2,300 deaths. This figure is comparable to the 1,400 South Vietnamese civilians killed and the 9,000 kidnapped by the Viet Cong in the first 9 months of 1965.

3. Evaluation of North Vietnam Propaganda Claims

Twenty-three North Vietnamese propaganda claims contained precise civilian casualty figures, and these have been analyzed insofar as possible. Eighteen of the 23 claims could be checked by photographic analysis. Of these, only 3 damage claims could be confirmed with certainty and one claim tentatively. Three of the claims are not supported by photography. Photography for the remaining 11 claims does show damage outside target areas. It is not possible, however, to identify the existence of the buildings or institutions claimed by Hanoi to have been attacked.

Confirmation or refutation of specific North Vietnam propaganda claims is made difficult by the vague and generalized manner in which they are expressed. In many cases even the specific geographic area of the attack cannot be identified. An outstanding example of exaggerated propaganda statements of the North Vietnamese is the claim of the number of US/South Vietnamese aircraft destroyed. On 26 October, they claim to have shot down the 700th aircraft. The actual number lost up to that date is 130. It is significant to note that there is also evidence that the North Vietnamese have attempted to alter the appearance of institutional structures. In the case of hospitals particularly, the identifying markings are placed on the sides of buildings in a way that they are not easily distinguishable from the air.

4. The Evaluation of Air Strikes by the Hanoi Regime

Both the actions and the statements of the Hanoi regime indicate that it has a realistic understanding of the current objectives of the US bombing effort against North Vietnam. An awareness of the US intent to impede the flow of supplies and men to the Viet Cong and, over the longer run, to make continued physical support of the insurgency too costly for North Vietnam was evident in statements by DRV spokesmen shortly after the first sustained aerial attacks began. Last March, for example, the editor of the Party newspaper took note in a commentary of the "US contention" that it attacked North Vietnam because it hoped to "prevent the North from supplying arms to the South" and force the DRV to "leave its neighbor in peace."

Hanoi's military actions strongly suggest that it does not believe the attainment of these objectives currently emphasizes the bombing of targets surrounded by heavily populated areas or includes random and indiscriminate attacks aimed primarily at breaking popular morale and causing maximum hardship. Since the aerial attacks began last February, both SAM and conventional antiaircraft defenses have been strengthened primarily along the lines of communication and around industrial/defense types of targets.

Since mid-September a considerable portion of the SAM deployment effort in North Vietnam has apparently been devoted to lining the communications routes south from Hanoi toward Thanh Hoa and possibly Vinh with a group of SAM sites. The relative safety of towns and populated centers, in Hanoi's view, is also attested by the experience of US pilots in attacking vehicles on roads in North Vietnam. The vehicles, if possible, make an effort to seek shelter by entering the towns in the evident belief that they will not be attacked there. The relatively low number of casualties suffered as the result of the bombings could also be viewed in Hanoi as evidence that the targets are currently selected carefully with a view to minimizing collateral damage.

The evidence in Hanoi's statements and deeds, however, does suggest that the regime believes the United States will eventually abandon many of its limitations on bombing activity in the North. It seems probable that the regime expects that the United States may at least attempt to knock out all fixed economic assets, whether or not they are surrounded by heavily populated areas. An editorial in the army daily newspaper in late August, for example, implied that the United States in the future might strike at "the remaining intact construction projects, bridges, and factories in the north." There is also evidence of the strengthening of antiaircraft defenses near factories and key installations in the environs of Hanoi and Haiphong, together with changes in working hours in order to make personnel less vulnerable to attacks.

Although it can only be speculated on, it is possible that the regime believes that the United States will eventually abandon all limitations and begin indiscriminate aerial warfare against North Vietnam. In the last few months, responsible regime spokesmen, including the Minister of Defense, have begun to show concern over the possibility of a US land invasion of North Vietnam. It seems probable that Hanoi would estimate that an all-out aerial attack on the DRV would be tried for its effect before a ground assault on the North.

For propaganda purposes, Hanoi is already attempting to project the illusion that the United States is carrying out indiscriminate air raids. Hanoi's public information media routinely portray the strikes as an effort to "destroy the peaceful labor of the North Vietnamese people." The propaganda never admits the destruction of any military target, charging rather that the strikes are aimed at "populated centers," or at "economic" targets, and the like. These charges, of

course, are aimed mainly at enlisting sympathy and support from abroad for the Vietnamese Communist cause.

5. Economic and Military Damage*

The economic losses caused by US/South Vietnamese air strikes are small in relation to total economic activity. These losses have not reached the point where the ability of North Vietnam to support the current level of military activities in South Vietnam has been appreciably weakened. There are, however, increasing signs of strain on the economy: (a) difficulties in food distribution; (b) a diversion of skilled manpower and scarce materials from productive uses to the repair of damaged facilities; and (c) the disruption of normal work hours and production through civil defense measures. The measurable total direct losses to economic facilities and equipment now are estimated at about $20 million. Most of these losses have fallen on the transportation sector of the economy. Permanent reconstruction of destroyed or damaged railroad and highway bridges will cost about $8 million and the replacement of transport equipment will cost over $4 million. Temporary measures to keep traffic moving cost $1 million. Reconstruction costs in other sectors of the economy range from $500,000 for repair of damaged petroleum storage facilities to $1 million for a damaged textile mill and $4.5 million for the reconstruction of damaged electric power facilities. Measurable indirect economic losses attributable to the air attacks include estimated losses of $6.5 million in foreign exchange earnings and about $6 million from disruption in agriculture.

The total measurable costs of reconstruction, replacement, or repair of damaged facilities amount to almost 20 percent of total gross annual investment in industry.

The main impact of the attacks is being felt in the southern areas of North Vietnam. These areas, however, account for only 20 percent of total gross industrial output. Because these areas are primarily rural and the local economy is basically of a subsistence type, they continue to function. The cumulative effect of the bombings is now beginning to be noticeable in the more developed parts of the country. Its effectiveness can be seen in failures to meet production schedules, delays and postponements in some development projects, and a general reordering of investment programs and priorities.

The air attacks to date have not resulted in a critical deterioration of the country's productive capacity. About 17 percent of the petroleum storage facilities have been destroyed; the remaining storage capacity is adequate to supply normal requirements for a year. In the electric power industry, 13.5 percent of national capacity has been destroyed, and the economic effects are largely local because only one of the power stations attacked was integrated with the national power

* See Appendix C.

grid. Losses of transportation equipment for the most part have been more than compensated for by increased imports of equipment from the USSR and China. The North Vietnamese have been able to keep traffic moving on vital railroad and highway links so that high-priority economic and military traffic is generally able to move.

A final effect of the damage sustained by the economy is to increase the reliance of North Vietnam for economic assistance on other Communist countries.

The air strikes against North Vietnam have caused a gradual erosion of national capacity in specific military areas. More than one-third of the capacity of ammunition depots; over 12 percent of the capacity of barracks; and about 10 percent of the capacity of supply depots have been destroyed. The effect of these losses has been offset, however, by their abandonment and the large-scale dispersal of men and materials to less vulnerable areas. Damage to lines of communication and transportation facilities has impeded but has not eliminated the capability to move men and supplies.

The ability to reduce national capacity in some categories vital to military support is very limited because most of them are located in sanctuary areas. Some 50 percent of maritime port capacity and about 60 percent of petroleum storage and electric power facilities are within the restricted areas.

Four damaged airfields at Vinh, Dong Hoi, Na San, and Dien Bien Phu are unserviceable. The North Vietnamese appear, however, to have suspended operations at these facilities and are concentrating their military air resources at airfields in and north of the Hanoi area.

The air attacks on the more sensitive lines of communication have had one particularly useful effect. While they have not reduced North Vietnam's capability to conduct current levels of defensive operations, they have reduced its capability to launch an invasion of South Vietnam.

There is, finally, no evidence to indicate that the air attacks against North Vietnam have had any success in diminishing the willingness of the Hanoi regime to continue its sponsorship, training, and support of the Communist forces currently deployed in Laos and South Vietnam.

APPENDIX A

RÉSUMÉ OF AIR STRIKE PROGRAMS AGAINST NORTH VIETNAM

A. Objectives

The basic objective of military actions against North Vietnam (DRV) is to apply pressures to cause the DRV to cease and desist in supporting and directing the insurgencies in South Vietnam and Laos.

The specific objectives of the ROLLING THUNDER air strike program against North Vietnam are (1) to reduce the DRV capabilities to support the above insurgencies, and (2) to exact a progressively mounting price for their continuing to do so.

The foregoing statements of objectives may be found, with some variations of language, in a succession of formal recommendations by the Joint Chiefs of Staff dating back at least to November 1964, the most recent of which is dated 2 September 1965, and all of which are believed to be available to appropriate authorities.

B. Program

The first air strikes against the DRV were the PIERCE ARROW strikes of 5 August 1964, reprisal for the PT attacks against the US destroyers in the Gulf of Tonkin. Only one fixed target [redacted] was authorized and struck; all remaining strike effort was specifically directed against DRV naval craft in base areas at Hong Gay, Phuc Loi, Quang Khe, and in the Loc Chau estuary. 25X5

The next strikes were in February 1965, when two reprisal actions were undertaken in response to Viet Cong attacks on US installations in South Vietnam. These reprisals, FLAMING DART I and FLAMING DART II, struck the [redacted] on 7 February, [redacted] 25X5
UNCODED [redacted] southeast of Dong Hoi) on 8 and again on 11 February, and [redacted] Dong Hoi area) on 11 February. 25X5

No "target of opportunity" or other armed reconnaissance-type activity was included in any of the above.

The ROLLING THUNDER program then emerged, reflecting among other considerations the JCS recommendations of 11 February 1965 for initiating a systematic program of air strike pressures.

ROLLING THUNDER 1 was scheduled on 20 February 1965 as a one-day reprisal strike by US and South Vietnamese Air Force (VNAF) forces, against Quang Khe Naval Base and Vu Con Barracks, with two additional barracks and an airfield listed as weather alternates. ROLLING THUNDER 1 was cancelled because of a coup in Saigon. ROLLING THUNDER 2, 3, and 4 were then planned, also in the reprisal context, but subsequently cancelled due to nonavailability of VNAF forces (on alert for the Saigon coup), because simultaneous participation was desired for reasons of policy.

The first actual ROLLING THUNDER strike was ROLLING THUNDER 5, a one-day, no recycle strike on 2 March 1965. Targets were one ammunition depot and one naval base as primary US and VNAF targets, and four barracks as weather alternates; VNAF participation was mandatory. This comprised the total approved effort for the week, a level substantially below that recommended by the Joint Chiefs of Staff.

Additional details as to targets struck and dates, weights of effort, results, etc., on these and later dates may be found in the DIA "DRV Target Analysis." The following paragraphs therefore touch primarily on the operational highlights.

ROLLING THUNDER 6 was another one-day fixed-target program representing a week's weight of attack. Napalm was authorized for the first time, but aircraft recycle continued to be prohibited, for reasons other than military.

ROLLING THUNDER 7 relaxed the mandatory one-day strike execution to a week's period (19-25 March) and included five primary targets with weather alternates. The requirement for concurrent timing of US and VNAF strikes was removed. One US and two VNAF armed reconnaissance missions were authorized during the 7-day period, on specified route segments in the southern DRV, and authority to strike three fixed radar sites located one on each route was included.

ROLLING THUNDER 8 (26 March-1 April) included nine radar sites for US strike, and a barracks for VNAF. The radar targets reflected primarily policy-level interest in attacking additional purely military targets in southern DRV, as they are not lucrative targets, operationally, in a program in which the weight of effort is otherwise limited. Three armed reconnaissance missions were again authorized, against specified route segments, during the period with US armed reconnaissance conducted against DRV patrol craft and along the coast from Tiger Island north to 20° to include restrike against operational radar sites. VNAF armed reconnaissance along Route 12 from Ha Tinh to 2 miles east of Mu Gia Pass also was authorized.

ROLLING THUNDER 9 (2-8 April) inaugurated a planned line-of-communication interdiction campaign against the DRV south of Latitude 20° N. The [redacted] were the northernmost fixed-target cuts in this campaign, to be followed

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by additional cuts, plus armed reconnaissance to sustain the interdiction. ROLLING THUNDER 9 (2-8 April) through ROLLING THUNDER 12 (23-29 April) completed the fixed cuts recommended for accomplishment in 2 weeks, of 26 bridges and 7 ferries.

ROLLING THUNDER 9 was authorized three armed reconnaissance missions on specified route segments. This was increased to not more than 24 armed reconnaissance strike sorties per 24-hour period in ROLLING THUNDER 10 through ROLLING THUNDER 12, a level of effort considered by the JCS to be well short of that required for significant military effectiveness in the area concerned.

From the start of ROLLING THUNDER reconnaissance through ROLLING THUNDER 9, armed reconnaissance targets were limited to locomotives, rolling stock, vehicles, and hostile DRV craft. For ROLLING THUNDER 10 through ROLLING THUNDER 12 the rules were changed to provide day and night armed reconnaissance missions to obtain high levels of damage to military movement facilities, ferries, radar sites, secondary bridges, railroad rolling stock, and to interdict the lines of communication by cratering, blockage, and restriking and to provide for reseeding blockage points as necessary for sustained effectiveness of interdiction.

Geographical coverage by armed reconnaissance, from the beginning limited to specified segments of designated routes, had increased by ROLLING THUNDER 9 to one-time coverage of Routes 1 (demilitarized zone to 19-58-36N), 7, and 8. In ROLLING THUNDER 10 through ROLLING THUNDER 12, this was further extended to cover Routes 1 (19-58-36N), 7, 8, 15, 101, and lateral roads between these routes.

The dropping of unexpended ordnance on Tiger Island was authorized in this period, as the alternative to the prior requirement to jettison in the sea.

ROLLING THUNDER 13 (30 April - 6 May 1965) through ROLLING THUNDER 18 (11-17 June) continued US and VNAF strikes against 53 fixed military targets (five restrikes) as follows: six ammunition depots, five supply depots, 21 barracks, two airfields, two POL storages, two radio facilities, seven bridges, two naval bases, one railroad yard, one SAM site, two thermal powerplants, one port facility, and one ferry and intensified armed reconnaissance weight of effort without, however, extending its area. It was apparent to the JCS that the targeted barracks and depots had by now been vacated and that few lucrative military targets remained south of Latitude 20°N.

During this 6-week period, armed reconnaissance sorties were expanded to a maximum allowed rate of 40 per day and a maximum of 200 per week (60 additional armed reconnaissance sorties were authorized for ROLLING THUNDER 17). The chart, Figure 2,* shows the armed reconnaissance weight of effort history for this and other periods. Although this period saw

* Inside back cover.

a significant increase, the new level was considered well below military capabilities and requirements for effectiveness, and the militarily desirable element of tactical surprise had been dissipated by the initial, limited effort of armed reconnaissance.

Air strikes against fixed targets and armed reconnaissance were suspended over North Vietnam for political purposes for a 5-day period (13-17 May).

With ROLLING THUNDER 13, armed reconnaissance authorizations changed from stated routes, etc., to more broadly defined geographical areas (see the map, Figure 3*), in this case routes within the area south of Latitude 20°N.

Although ROLLING THUNDER 15 included air strikes against one DRV SAM site, subsequent ROLLING THUNDER missions during this period directed that DRV SAM sites be avoided and not attacked. Tactical principles of military prudence and logic were in this case subordinated to considerations of higher strategy.

Armed reconnaissance targets were expanded during this 6-week period to include railroad rolling stock, trucks, ferries, lighters, barges, radar sites, secondary bridges and road repair equipment, DRV naval craft, bivouac, and maintenance areas. Emphasis was placed on armed reconnaissance of routes emanating from Vinh in order to restrict traffic in and out of this important line-of-communication hub. ROLLING THUNDER 18 added the provision that authorized day armed route reconnaissance sorties could include selected missions to conduct small precise attacks against prebriefed military targets not in the JCS target list, and thereafter conduct armed route reconnaissance with residual capability.

ROLLING THUNDER 14 added authority for returning aircraft to use unexpended ordnance on Hon Nieu Island Radar Site, Hon Matt Island Radar Site, Dong Hoi Barracks, or railroad and highway line-of-communications targets, in addition to Tiger Island previously authorized for this purpose.

ROLLING THUNDER 19 (18-24 June) through ROLLING THUNDER 21 (2-8 July) scheduled US and VNAF air strikes against a total of 24 fixed targets (7 restrikes) as follows: 11 barracks, 3 supply depots, 3 ammo depots, 2 airfields, 2 radar sites, 2 bridges, and 1 POL. Targets No. 25, Son La Barracks, and No. 26, Dien Bien Phu Barracks, included in these, are large, widely dispersed targets containing many separate structures and requiring several hundred sorties for a high level of destruction. For nonmilitary reasons, however, attacks on these targets were restricted to 80 strike sorties against either of the two barracks areas in any ROLLING THUNDER weekly period.

* Inside back cover.

ROLLING THUNDER 20 included restrike of Dong Hoi and Vinh Airfields, observed to be under construction.

ROLLING THUNDER 21 expanded the armed reconnaissance sorties limit from 40 per day, 200 per week, to a maximum 250 sorties per week, with weight of effort and timing to be at discretion of CINCPAC. Separate requests for additional armed reconnaissance sorties in certain circumstances were approved in a number of cases in this and later periods.

These ROLLING THUNDERS added extensions to the northwest of the armed reconnaissance area. These armed reconnaissance area extensions continued the previous pattern in which these extensions followed the locations of the fixed targets authorized for strike during previous missions.

Specific rules were again incorporated prohibiting attacks on DRV SAM sites or MIG airbases, tactical considerations notwithstanding.

With ROLLING THUNDER 22/23 (9-22 July) there began the practice of authorizing 2-week packages, the 2-week periods being given two ROLLING THUNDER numbers to simplify continuing statistical comparisons, and so forth. Some additional operational planning flexibility was thus accorded the operational commanders, as compared to the earlier one-week cycles, but several operational problems caused by this authorization procedure remain.

ROLLING THUNDER 22/23 (9-22 July) through ROLLING THUNDER 32/33 (17-30 September) struck a total of 61 fixed targets (27 restrikes) as follows: 26 barracks, 13 ammunition depots, 2 port facilities, 7 bridges, 2 explosive plants, 2 thermal powerplants, 6 supply depots, 1 hydroelectric powerplant, 1 lock, and 1 POL depot.

During this 12-week period, armed reconnaissance sortie limits changed with ROLLING THUNDER 26/27 from 500 to 600 sorties per 2-week period, 1,000 for ROLLING THUNDER 28/29, and 1,200 for ROLLING THUNDER 30/31 and ROLLING THUNDER 32/33. A number of additional sorties were requested and authorized.

The armed reconnaissance area was extended northwest and north to follow fixed target strike areas, remaining 30 nm from the Communist China border. This 30 nm buffer was prescribed as an intended safeguard against military operational hazards not acknowledged in the military community.

Armed reconnaissance targets specified in ROLLING THUNDER 18 were expanded in ROLLING THUNDER 22/23 and ROLLING THUNDER 24/25 by the

provision that airfields and JCS numbered line-of-communications targets, which had been assigned in previous ROLLING THUNDER strikes and were observed to be under repair, were authorized for strike to keep them nonoperational. To this was added in ROLLING THUNDER 26/27 "naval craft berthing areas." The restrike limitation on these three categories was expanded in ROLLING THUNDER 30/31, withdrawn in ROLLING THUNDER 32/33, and reinstated in ROLLING THUNDER 34/35, with authorization for armed reconnaissance strikes on JCS numbered targets assigned in previous ROLLING THUNDER strikes and lying within the armed reconnaissance area.

SAM attacks against US aircraft began during ROLLING THUNDER 17 launched from within areas denied to strike aircraft. It was soon apparent that the SAM battalions were using mobile ambush tactics. Not until ROLLING THUNDER 28/29 were ROLLING THUNDER sorties authorized to strike SAM systems, and then only those found within the authorized ROLLING THUNDER armed reconnaissance area.

ROLLING THUNDER 24/25 introduced the provision that returning ROLLING THUNDER aircraft which would be over-flying Laos were authorized to use unexpended ordnance to attack RLAF-targeted road segments in Laos. ROLLING THUNDER 30/31 introduced the converse of this for BARREL ROLL and STEEL TIGER missions (Laos), with authority for weather alternate targets in the ROLLING THUNDER area.

These provisions represented a relaxation of strict Washington rules separating operations over Laos and North Vietnam. With ROLLING THUNDER 28/29 the targets authorized for unexpended ordnance were expanded to include eight named large barracks/headquarters complexes.

ROLLING THUNDER 34/35 (1-14 October) through ROLLING THUNDER 36/37 (15-28 October), which for the first time authorized attacks against the primary land lines-of-communication to the northeast of Hanoi, included strikes against a total of only 10 fixed targets (of which one was a restrike), as follows: 7 bridges, one ammunition depot, one supply area, and one barracks area. This represented a marked reduction of effort against fixed targets, in contrast to the recommendations of the Joint Chiefs of Staff. The recommendation by the Joint Chiefs of Staff to extend armed reconnaissance to the areas northeast of Hanoi in both these ROLLING THUNDER proposals was disapproved.

ROLLING THUNDER 38/39 (29 October - 11 November) adds six more fixed targets and continues the armed reconnaissance program under the previously established limits. Again, the targets are along the lines-of-communication leading from Hanoi to the northeast, east, and south. In addition, an SA-2 SAM facility within the 30 nm circle of Hanoi was included for the first time.

C. Pre-Strike Casualty Estimates

Each JCS-numbered target authorized by the national authorities for inclusion in the ROLLING THUNDER strike program is described to those authorities in detail. The description is in written "target data summaries" (TDS), which include among other things photography and the JCS estimate of expected casualties, both military and civilian, for each target.

The casualty estimates thus presented are based on DIA calculations for the expected weapon delivery accuracies (CEP), for each specific target concerned (including surrounding areas out to a distance of 3 CEP), and for the total weight of attack expected to achieve the JCS specified level of damage. The DIA calculations are for a fully populated (i.e., fully non-alert) target condition. For the TDS, these calculations are further modified to an assumed alert condition estimate by multiplication by 0.1 (a jointly developed DIA-Joint Staff judgment factor).

In the case of pre-strike casualty estimates for recorded "restrikes," three factors must be considered. First, for quite some time, attack of fixed targets in small incremental strikes has been authorized, the intention being to build up to the total desired level of damage without mutual interference among many attacking aircraft such as by dust and smoke at the target. In a simple listing of strikes each of these increments would appear as a separate event, but it should be recognized that only their cumulative total would be comparable to the total weight of effort reflected in the basic casualty calculations. Next, in second and later increments of such strikes, casualties would often be expected to be less than the share pro-rated by weight of effort, because of target abandonment, and so forth. Finally, the foregoing target abandonment aspect tends to be offset in certain other restrike events, such as the restrike of Vinh airfield, where personnel activity (in this case the repair of the airfield) was the cause for the restrike.

So far as concerns the TDS pre-strike casualty estimates for the national authorities, no attempt was made to refine those estimates to reflect the foregoing. Thus it appears that the most valid appreciation of the total estimated casualties which the national authorities accepted in advance, for approved fixed target strikes, is the simple total of TDS casualty estimates.

For the targets in the seven North Vietnamese towns treated in Appendix B, Part C, these totals are as follows:

	In Target Area		Adjacent to Target		
	Military	Civilian	Military	Civilian	Total Military and Civilian
Ha Tinh	48	15	1	39	103
Ben Thuy	0	54	2	9	65
Thanh Hoa	132	75	5	29	241
Dong Hoi	593	15	10	23	641
Vinh	1,201	37	13	24	1,275
Nam Dinh	0	6	0	33	39
Yen Bay	360	0	9	2	371
Total	2,334	202	40	159	2,735

For the 125 approved JCS-numbered targets struck through 5 November 1965, pre-attack TDS casualty estimate totals are:

	In Target Area	Adjacent to Target	Total
Military	5,806	252	6,058
Civilian	242	387	629
Total casualties	6,048	639	6,687

D. Yen Bay Strikes

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The total of seven strikes on Yen Bay (9-17 July) include an example of a kind of operational mistake which can occur in war. The only authorized or assigned target in Yen Bay is the [redacted] UNCODED This target was struck with small incremental strikes on July 9, 10, 11, 12, and 17, by a total of 34 strike aircraft. A small railroad marshaling yard in the town is not on the JCS-numbered target list (reflecting the combination of its location in the town and its small importance). It is not an authorized armed reconnaissance target, because of the rule against strikes in populated areas, and in any case armed reconnaissance in the Yen Bay area had not been authorized as of the time of the Yen Bay strike. Yet it was hit by Thai-based aircraft on July 11, 13, and 14. Information of the unauthorized strike of this target was relatively late in arrival at higher headquarters because of the slow relay of pilot debriefs. As soon as it became known to CINCPAC he took steps to prevent further strike of the yard.

APPENDIX B

ESTIMATES OF CIVILIAN CASUALTIES

A. The Problem and Its Setting

1. North Vietnamese Claims

The number of civilian casualties in North Vietnam which have resulted from bombing attacks by the United States and the Government of Vietnam cannot be estimated with any precision. There are a number of facts, however, which bear on the problem and collectively permit a first approximation.

The United States has adopted self-imposed restrictions on its air offensive against North Vietnam both in terms of the areas covered and the types of targets attacked. Large territorial areas which include most of the industrial centers and the heavily populated cities of North Vietnam have, indeed, not been included in the US/GVN attack. These area restrictions and the limitation on types of targets are designed, among other things, to keep civilian casualties to a minimum. However, North Vietnam's propaganda asserts the air offensive to be a vicious and unrestrained assault upon the civilian population, hospitals, schools and non-military objectives. It is quite understandable that the Hanoi regime would take this attitude in order to influence world opinion.

North Vietnam has released no official figures on casualties from US airstrikes. North Vietnamese press and radio broadcasts and formal protests by the Vietnamese People's Army (VPA) to the International Control Commission (ICC) imply that casualties are inordinately high. The closest approximation to an official North Vietnam claim of total casualties -- presumably both military and civilian -- is 75,000.

Only a few North Vietnamese official statements give precise casualty figures for specific incidents. A tabulation of these figures claimed by North Vietnam for 24 incidents is presented in Table 1 of this Appendix. This tabulation indicates a claim of 722 casualties, of which 317 were killed and 239 were wounded. The largest single claim was for 219 casualties at the leper sanatorium at Quynh Lap. The probable validity of this claim is discussed below.*

In addition to these specific casualty claims, the North Vietnam regime also claims that 124 schools and 30 medical installations have

* See p. 37, below.

APPENDIX B - Table 1

Civilian Casualties from US Bombing Specified in North Vietnamese Propaganda a/
1965

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Date	Alleged Target	Time (Local)	Location			Alleged Casualties		
			Province	District	Town or Village	Number Killed	Number Wounded	Number Killed and Wounded
7 Feb	Hospital	1300			Dong Hoi		5	5
5 Feb	Medical station and secondary school	1530	Vinh Linh	Special Zone	Ho Xa	10		10
21 Mar	Medical station	N.A.	Quang Binh	N.A.	Quang Phuc		2	2
26 Mar	Medical station	N.A.	Quang Binh	N.A.	Canh Duong		4	4
31 Mar-5 Apr	Huong Khe hospital	N.A.	Ha Tinh	Huong Khe	N.A.	1		1
13 Apr	Medical station	N.A.	Quang Binh	N.A.	Hai Trach		4	4
14 Apr	Medico-maternity station	N.A.	N.A.	N.A.	Duc Trach		2	2
28 Apr	Medical establishment	N.A.	N.A.	N.A.	Than Trach		2	2
23 May	Medical station	N.A.	N.A.	N.A.	Vinh Long		1	1
23 May	School and hospital	N.A.	Nghe An	Nghi Dan	N.A.			
	Tu Tru Market	N.A.	Thanh Hoa	Tho Xuan	Tu Tru	N.A.	N.A.	79
12 Jun	Quynh Lap Leper Sanatorium	2000	Nghe An	N.A.	Quynh Lap	139	80	219
26 Jun	Medical station of Viet Trung State Farm	N.A.	N.A.	N.A.	N.A.	4	2	6
1 Jul	Hospital	1015	Quang Binh	Tuyen Hoa	N.A.		2	2
2 Jul	Nam Dinh Town	N.A.	Nam Ha	My Loc	Nam Dinh	11	65	76
5 Jul	Trung Son agricultural cooperative	N.A.	Thanh Hoa	Thien Hoa	N.A.	35	22	57
8 Jul	TB Sanatorium No. 71	N.A.	Thanh Hoa	Duong Son	Thanh Hoa	N.A.	N.A.	40
9-11 Jul	Office of Yen Bay Provincial Medical Service, Yen Bay hospital, antiepidemic hygiene station, anti-TB station, and provincial station for protection of mothers and children	N.A.	Yen Bay	N.A.	N.A.	47		47
11 Jul	Cua Lo sanatorium	N.A.	Nghe An	N.A.	N.A.	1		1
N.A.	Houses and kindergarten of Xuan Son agricultural cooperative	N.A.	Thanh Hoa	N.A.	N.A.	36	22	58
25 Sep	Secondary school	N.A.	Nghe An	Quynh Luu	Quang Phong	14	26	40
28 Sep	Fishing boats (shelled by US ships)	N.A.	Nghe An	Nghi Loc	Nghi Tien	N.A.	N.A.	4
12 Oct	Bong market	1640	Nghe An	Yen Thanh	N.A.	N.A.	N.A.	43
N.A.	Nursery school at Thieu Van agricultural cooperative	N.A.	Thanh Hoa	N.A.	N.A.	19		19
TOTAL								722
Of which:						317	239	

a. This table covers casualties from alleged attacks on specific civilian targets reported in all communiqués or protests from the Vietnamese People's Army (VPA) to the International Control Commission (ICC) during 1 February 1965 - 1 November 1965. In addition, casualties reported in statements issued by the Ministry of Public Health in July and October 1965 and by the Ministry of Education in October and other casualties reported in North Vietnam's press and radio broadcasts during 1 October - 1 November 1965 are included.

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been bombed. An example of exaggerated propaganda statements of the North Vietnamese is the claim of destroyed US/GVN aircraft. On 26 October they claimed to have shot down the 700th aircraft. The actual number lost as of 26 October, however, is 130.

The validity of the latter assertions is particularly difficult to assess because of the general vagueness with which they are reported by the North Vietnam radio and press. Both news accounts and formal protests to the ICC commonly report that US aircraft bombed "residential quarters," "densely populated areas," or "schools and hospitals" identified only by province or district. A careful attempt has been made to analyze these claims by examining both bomb damage assessment reports and post-strike photography. The results of this analysis are discussed in Section G of this Appendix.

2. US Estimates of Civilian Casualties -- Sources of Data

The sources available for estimating civilian casualties do not allow precise measurement of total casualties.

[redacted]

A third source of casualty estimates is derived from the interpretation of post-strike photography. An overwhelming volume of such photography is available, and it has not been possible to do more than sample it. However, the areas hardest hit have been concentrated on because these would almost inevitably be the location of the greatest number of casualties. For a general appraisal of this source as a tool for estimating civilian casualties, see Section C.

3. Limits to the Range of US Estimates

a. Defining Civilian Casualties

The official prestrike estimates of civilian casualties prepared for the JCS are prepared by using precisely delimited conditions and parameters. The estimates of total civilian casualties presented in this report, however, reflect analysis of all available post-strike data so that the estimates are, insofar as possible, a statement of actual casualties. Our estimates for attacks on fixed targets are restricted to those civilians living or present in buildings located outside the target area and which were destroyed or damaged by an air attack. In the case of the estimates for civilian casualties resulting from armed reconnaissance missions, the data base enables a total estimate of civilian casualties both within and without the immediate target area.

More than 70 percent of the strikes flown through 1 November have been against military targets. The civilian population within these target areas would be substantially smaller than the civilian population outside target areas. The civilian casualties within the target area would, however, tend to be proportionately higher. Thus prestrike estimates made for the JCS indicate that civilian casualties within a target area would be about 60 percent of the civilian casualties outside the target area or 242 within and 387 outside the target area. These estimates of civilian casualties within the target area are believed to be probably of the right order of magnitude. The prestrike casualty estimates also indicate that military casualties would exceed civilian casualties by a ratio of about 10 to 1.

b. Population Exposed to Attack

To provide a more meaningful base on which to estimate civilian casualties, a systematic delimitation of the target areas has been made. Most of the air attacks in North Vietnam have concentrated on an area including about 25 percent of the population. Within this area more than 450 strikes -- excluding armed reconnaissance missions -- have been flown against 92 military and 58 economic targets.* These targets are located at 104 geographic points, of which 8 are uninhabited areas, 41 are rural areas, and 55 are urban areas. The total population of these points, and consequently the population actually exposed to air attack, is about 700,000, predominately in urban areas. There is substantial and authoritative evidence to justify the conclusion that this population is protected from the full impact of air attacks through partial evacuation measures and civil defense efforts. Thus casualty estimates need to be made on the assumption of

* See Table 2 of this Appendix.

APPENDIX B - Table 2

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Rolling Thunder: Target Distribution by Type and Population Density and Population Exposed to Air Attack
Through 28 October 1965
(Numbers in parentheses indicate population density in persons per square mile)

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Fixed Targets	Total Strikes	Target Distribution by Population Density: Uninhabited (0-3)	Rural (3-130)	Urban (More than 130)	Total	Population Potentially Exposed to Attack [a]: Uninhabited (0-3)	Rural (3-130)	Urban (More than 130)	Total
Economic									
Bridges	76	5	11	19	35	50	1,100	235,000	236,150
POL storage	10		1	3	4		100	146,000	146,100
Powerplants	16		1	4	5		100	145,000	145,100
Ports	13			2	2			45,000	45,000
Railroad yards	3			1	1			46,000	46,000
Locks	2		1		1		100		100
Ferries	14		4	6	10		400	96,000	96,400
Subtotal	134	5	18	35	58				
Military									
Barracks	179	2 [b]	12 [c]	32 [d]	46	20	1,200	319,000	320,220
Ammunition depots	59	1	7 [e]	6 [f]	14	10	700	51,000	51,710
Supply depots	30		5	4	9		500	76,000	76,500
Airfields	10	2		2	4	20		64,000	64,020
Naval bases	12			2	2			20,000	20,000
Communications installations	2		1	1	2		100	10,000	10,100
Radar	28	1	5	7	13	10	500	103,000	103,510
SAM sites	2			2	2			20,000	20,000
Subtotal	322	6	30	56	92				
Total	456	11	48	91	150				

a. These columns should not be added, since a specific populated point may contain more than one economic and/or military target. The unduplicated population of points exposed to air attack is 700,000.
b. Including two combination barracks and supply depots.
c. Including three combination barracks and supply depots.
d. Including four combination barracks and supply depots and two combination barracks and ammunition depots.
e. Including one explosives plant.
f. Including ordnance depot and combination ordance and ammunition depot.

previous warning and protective measures as discussed in the following section on civilian defense and the section on methodologies for estimating casualties.

Photographic intelligence in many cases indicates bomb damage to civilian buildings surrounding immediate target areas to be 1 to 1.5 percent of the total structures in the built-up area. If this damage level were to be applied uniformly to all target areas, and if casualties were estimated to be equal to physical damage, then estimated casualties among the maximum of 700,000 persons theoretically exposed to attack would range from 7,000 to 10,000. However, given warning and an active civil defense, it seems improbable that casualties actually sustained would reach this level.

c. Civil Defense Measures

For the past year, CIA has made a weekly analysis of civil defense activities in North Vietnam. We have noted a significant acceleration since early this year. No air attack to date, however, has been of a dimension or intensity to put the North Vietnamese civil defense system to a severe test. There are no reports of civil defense units handling any considerable number of casualties.

Civil defense is controlled nationally by the Directorate of People's Antiaircraft Defense in the Ministry of Defense, and at the province and town level by local civil defense committees. The latter control regular and auxiliary militia, fire departments, and the civilian "self-defense" units organized and trained for first aid, fire-fighting, control, shelter supervision, and repair activities. The organization of mobile medical units and first aid points has been reported in the North Vietnam press.

Measures taken to reduce casualties in North Vietnam include the thinning out or strategic evacuation of cities, some population dispersal from southern cities during daylight hours, and the extensive preparation and use of foxholes, trenches, and air-raid shelters. In some cases, hours of school and work have been adjusted to avoid disruptions during daylight hours, when air alerts are more frequent.

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d. Resettlement Evacuation

Since early this year, some North Vietnamese civilians have been evacuated to northern areas from Hanoi and the southern coastal cities. Old people, women, children, and the unemployed are mentioned most frequently as evacuees. Schools and university faculties have left the central Hanoi area, and some industry has been reported relocated

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or preparing to move. The Polish press reported in August 1965 that certain institutions, hospitals, and libraries were being evacuated and that thousands of women and nonworking men are leaving Hanoi every night for "distant regions." Elements of the central government have also left Hanoi to set up at points not more than 50 miles distant. Local government offices in other cities and towns have apparently relocated to nearby rural locations or are prepared to move quickly when ordered. Civilians have been evacuated on a resettlement basis to areas not far from their home city.

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e. Communications

Air raid alerts are the responsibility of Hanoi. Apparently, the alarm is passed principally by telephone to other areas. Locally, the alert is sounded by sirens or announced over the radio. Neighbors and some localities rely on bells, striking metal, drums, or other means to alert the population. The reported efficiency of the warning system has been mixed.

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f. Changing Work Hours and Dispersal

Frequent air alerts during daylight hours have apparently altered the routine of North Vietnamese cities. In and around Hanoi, government offices, schools, and some shops have shifted their work to the early morning and the evening hours. Thus work and school go on from about 0400 to 0900 and from about 1700 to 2100 hours. Similarly, schools in a number of other localities have shifted to morning or evening sessions, or both. Market places have been reported as being open only at night in several cities south of Hanoi.

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newspaper carried an article stating that practically the entire population of Nam Dinh leaves home for nearby villages during the day.

g. Shelter

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The existence of foxholes and/or trench shelters is apparent in photography of such target areas as Vinh, Nam Dinh, and Dong Hoi. It appears that every family must have its own foxholes or trench shelters; others are dug at frequent intervals along city streets. During 1965, many trenches have been roofed with timber or other available materials and covered with earth. In Hanoi, some trench shelters have been lined with brick and roofed with masonry. More elaborate concrete shelters have been seen at government buildings and hotels.

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It is unlikely that the entire population of larger urban areas is dispersed during daylight. There is sufficient evidence to accept a dispersal program for substantial groups of the population, particularly children, older people, and those engaged in the services sector of the economy such as transportation and the wholesale and retail trades. The nature of the dispersal program for workers in industry is less well defined. In some industries, the nature of the production process would preclude mid-day shutdowns. In sanctuary areas, such as Hanoi and Haiphong, there is no need to shut down industry. In the southern area of North Vietnam, the need is more apparent. It seems probable that factory operations are halted for long periods in target cities such as Vinh and Nam Dinh. It is equally probable that while the entire labor force is not sent to the country during daylight hours, the regime does attempt to avoid the daytime concentration of workers in facilities likely to be the target of air attack, and to provide nearby shelters for the work force.

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C. Examination of Major Targets

Photography of seven urban areas where targets have been attacked six or more times has been reviewed in order to determine the amount of damage to civilian-associated buildings outside of target areas. About 1.5 percent of the built-up area of Nam Dinh, a large city, has been damaged or destroyed, while considerably more than 2 percent of the downtown area of Vinh, a smaller city, has been damaged or destroyed. This photography reveals that the smaller the target and the urban area and the greater the number of strikes, the greater is the damage to civilian-associated buildings. Thus where it has been possible to examine post-strike photography, this study generally tends to support the methodology established to calculate the casualties in urban areas resulting from attacks on fixed targets stated in Section D, below.

A more detailed study of Nam Dinh and Yen Bay has been included in this section of the report. Nam Dinh is regarded as the most representative area of damage inflicted to civilian-associated buildings and has been used as a model for the calculation of civilian casualties in all urban areas except Yen Bay. Yen Bay is regarded as a special case because the percent of damaged or destroyed civilian-associated buildings to the total of all buildings in the area is higher than for any other city examined.

The following tabulation lists the seven urban areas for which study of photography has been undertaken with the number of strikes, the DIA pre-strike estimate of casualties and the estimates of casualties at these cities contained in this report.

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Name of City	Number of Strikes	DIA Pre-Strike Estimate a/	Estimated Casualties — Estimate in this Report Low	High
Ha Tinh	8	39	40	59
Ben Thuy	11	9	54	81
Thanh Hoa	18	29	105	158
Dong Hoi	14	23	70	105
Vinh	47	24	240	360
Nam Dinh	6	33	30	45
Yen Bay	7	2	75 b/	75

a. This estimate is for civilians in areas adjacent to the target.
b. Estimate based on methodology used for other cities covered by this report would be 34 to 52.

The photography reveals that there has been relatively more damage to civilian-associated buildings at Vinh, Thanh Hoa, Dong Hoi, Ben Thuy, and Ha Tinh than at Nam Dinh. This analysis is supported by several conditions. There have been more strikes against targets in these areas. The targets are less well defined and there appears to have been relatively more spillover on civilian-associated structures. The built-up areas are relatively smaller, compared with the areas affected by the strikes. Buildings are less well constructed in the small urban areas than in the large. In addition, there is probably less perfect warning of air strikes in the small areas than in the large, and civil defense measures are also less well enforced. All of these factors support the method used for calculating casualties in this report because weights are provided for the number of strikes and the size of the population in each urban area attacked.

1. Nam Dinh

Nam Dinh is the most important industrial city south of Hanoi. Its population is estimated at 90,000 and it accounts for about 80 percent of the gross industrial output in the area of North Vietnam thus far subjected to air attack.

Two air strikes (2 July and 4 July 1965) have been directed at the bulk petroleum storage area [redacted] and four air strikes (28 and 29 July, 2 and 3 August 1965) have been directed against a thermal powerplant [redacted] During the attacks on the latter target, the textile mill received superficial damage. An armed reconnaissance mission was directed against the railroad classification yard.

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[redacted]

A total of 139 buildings have been destroyed and 35 buildings damaged outside the target areas, representing about 1.5 percent of the built-up area of the city. Ordnance expended on this area during the strikes against the petroleum storage area include 75-to-250 pound general-purpose (GP) bombs and 6 Bullpups; and 15-to-250 GP bombs, 44 Bullpups (4/1000), and thirty-eight 2.75-inch rockets during the strikes against the termal powerplant.

A composite estimate of casualties to the civilian population has been computed, based on the pre-strike estimate prepared for the Joint Chiefs of Staff (JCS); a Defense Intelligence Agency (DIA) estimate of casualties, assuming warning and based on examination of post-strike photography; and an estimate drawn from World War II experience. The latter was based on a review of casualties in bombed German cities during 1943, before blockbusters were used and fire storms were created. The JCS pre-strike estimate of casualties for the six attacks against Nam Dinh, assuming no warning and only minimum civil defense measures, totals about 140 persons. If warning and some civil defense measures are assumed after the first strike, the JCS methodology would produce an estimate of 47 casualties. The DIA post-strike estimate, assuming warning and civil defense measures is 21. An estimate based on World War II experience*, which also included warning and civil defense measures, is 29.

Combining and averaging the high and low JCS estimates with the remaining two, produce a high of about 65 and a low of 30. The mean of these two estimates is about 45, which is regarded as the "probable" estimate of the number of casualties. Nam Dinh is a large industrial city; it would be expected to receive advance warning of an air attack and to have civil defense measures enforced on a disciplined population. Buildings would also be of more modern construction. Personnel trenches can be detected from photography of the area. The first attack did not occur until 2 July and after industrial targets had been attacked in other areas. It therefore appears reasonable to assume that some advance warning was received, at least after the first strike, and that precautions were taken to reduce casualties to the civilian population. If advance warning was received prior to the first strike, the number of casualties at Nam Dinh could have been as low as 30. The estimated civilian casualties at Nam Dinh as of 3 November are as follows:

Maximum 65 Probable 45 Minimum 30

2. Yen Bay

Yen Bay is a city of 6,000 population on the northwest railroad line about midway between Hanoi and Lao Cai on the border of China.

* In air attacks in Germany during 1943, 1 person was wounded for every 8 buildings destroyed or damaged, and 1 person was killed for every 25 buildings destroyed or damaged.

The principal target in this area has been the [redacted]. The area has been subjected to seven air strikes, and damage has been inflicted on the ordnance depot, the railroad yard, and a nonferrous metal plant and associated electric powerplant.

Aerial photography reveals that over 20 percent of the total civilian buildings in this complex have been damaged or destroyed -- 400 buildings destroyed and approximately 50 buildings damaged. Personnel trenches are visible around the railroad yard and adjacent to the athletic field. Two trenches were destroyed during the bombings. In addition, there are the start of personnel trenches along the main street near the railroad yard. The bulk of the destroyed and damaged buildings are found in this area, but the major civilian housing areas and the business district have not been damaged.

The percent of total civilian buildings destroyed or damaged in this area is so large that it would not be prudent to apply the methodology used for estimating casualties to other urban areas to Yen Bay. Had this method been used, casualties would have ranged from 34 to 52. A "best estimate" of 75 casualties has been calculated for Yen Bay. This estimate is based on experience in Germany during World War II, when there was one wounded for each 8 buildings damaged or destroyed and one killed for each 25 buildings damaged or destroyed.

D. Estimate of Fixed-Target Casualties

We estimate that strikes against fixed targets, including armed reconnaissance strikes against JCS targets, resulted in 1,700 to 2,400 casualties during the period 7 February to 28 October 1965. Of these, all but about 100 casualties resulted from strikes against targets located in urban areas, which for the purpose of this estimate are defined as areas with more than 130 persons per square mile. The methodologies for estimating the number of casualties in the urban and rural areas are explained in Section H of this Appendix.

During the period covered by this estimate, about 450 strikes were made against 150 targets in a little more than 100 localities. Of the total 150 targets, about 35 were economic targets located in urban areas. For further details of the target distribution by type and population density, see Table 2 of this Appendix.

About 75 percent of the strikes were made against targets in 55 urban areas, which ranged in size from Nam Dinh (90,000 population) to Ha Tinh (5,000 population). The same methodology was applied to all urban areas except Yen Bay, a city of 6,000 persons, in which very substantial damage to civilian structures resulted from the seven strikes against the Yen Bay ordnance depot. The remaining 25 percent of the strikes were made against nearly 60 targets in about 40 rural areas. About 10 targets were located in uninhabited areas for which no casualties could be expected.

E. Estimates of Civilian Casualties From Armed Reconnaissance Mission

The problem of estimating casualties from armed reconnaissance strikes, particularly the task of isolating military casualties from civilian ones, is much more difficult than the estimation of casualties from strikes on fixed targets. Some armed reconnaissance missions are reattacks on fixed targets, and have been taken account of elsewhere in this study.

The read-out of the film coverage of the armed reconnaissance routes gives no direct evidence of casualties. Except for infrequent instances, people are not visible in the photography. Pratically all the photography is after the fact, that is, it is post-strike and not strike photography. Armed reconnaissance is primarily confined to lines of communication such as roads, railroad lines, and waterways. Except for structures the targets are fleeting ones consisting of vehicles, watercraft, and rolling stock. Post-strike evidence consists of derelict targets and bomb craters; cannon and rocket firings leave little or no after-the-fact visual effects -- burned out vehicles and rail cars are the principal exceptions. When derelict targets appear in photography, it is usually quite difficult to determine with any degree of certainty that they served a civilian as opposed to a military function. The guides available to the pilot at the time of the strike are not usually in evidence in the post-strike film.

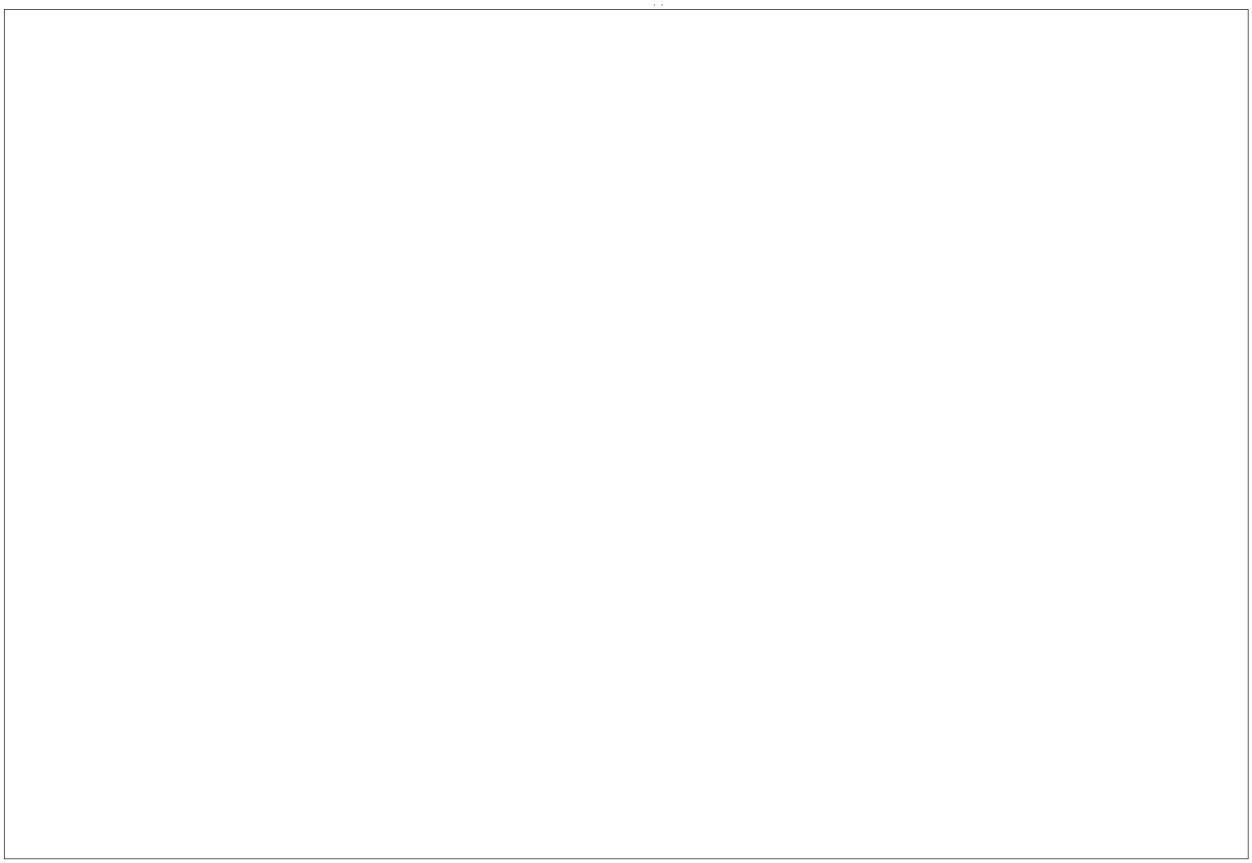
The authorized number of armed reconnaissance total route miles has grown from 554 beginning with Rolling Thunder 6 in March 1965 to the current total of 4,719 miles. This mileage includes roads, railroads, and waterway routes. All sections along the authorized armed reconnaissance routes are not struck with the same frequency. To get a feel for the frequency of exposure of people along these routes to airstrikes in a 24-hour period we can examine the route miles authorized versus sorties flown. Looking at the figures available for Rolling Thunder 32/33, (17-30 September 1965), we conclude that any point along the route authorized would have some possibility of being struck 1.17 times per day during that 2-week period. Such a rate would not appear to expose people to risk from these air strikes for a very long period of each day.

One technique for estimating a total number of casualties which could result from such strikes is to relate the average civilian population density, in rural areas in the provinces of North Vietnam under attack, to weapons effectiveness. Specifically, the total anti-personnel effective area for the various types of ordnance has been estimated and applied against a derived average population density figure. The mean area of effectiveness (MAE) figures are based on alerted people who have taken shelter in ditches or similar protective structures.

These casualty figures could not be meaningfully refined by a detailed analysis of random samples of actual armed reconnaissance strikes, but probably provide a basis for a minimum estimate of casualties as shown in the following tabulation.

Weapon	Mean Area of Effectiveness*	Number of Bombs or Rounds		Million Square Feet		Civilians per Million Square Feet	Casualties
250-pound bomb	1,650 x	12,500	=	20.6	x	15	309
500-pound bomb	2,500 x	9,700	=	24.2	x	15	363
750-pound bomb	2,400 x	26,800	=	64.3	x	15	965
1,000-pound bomb	5,800 x	2,900	=	16.8	x	15	252
2,000-pound bomb	4,750 x	500	=	2.4	x	15	36
2.75-in rockets	1,000 x	90,000	=	9.0	x	15	135
20-mm cannon	2 x	5,550,000	=	11.0	x	15	165
						Total	2,225

* Square feet.



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F. Estimated Total Casualties

The estimated total civilian casualties resulting from both air strikes against fixed targets and armed reconnaissance missions is in the range of 3,900 to 5,400 persons, probably divided about equally between killed and wounded. This estimate cannot be endorsed as one of precision or finality. It is, however, one that seems reasonably consistent with all the information available.

The impact of fewer than 2,500 deaths cannot be great in the total picture of North Vietnamese life. The official North Vietnamese figures for all deaths in 1964 are 130,000. However, the poor reporting systems and the unsophisticated statistical techniques as well as the propaganda value of low death rates makes these official figures suspect. Actual deaths in fact were probably more on the order of 350,000 in 1964, based on relationships between total population and total deaths in countries similar to North Vietnam. Under either measurement, the number of dead in a casualty estimate of 3,900 to 5,400 (about 2,400 deaths) would be an addition of about 1 to 2 percent to the normal expected deaths per year. The casualty estimate is also overshadowed by the accidental death rate in North Vietnam, which at 3 to 5 percent would have accounted for 10,500 to 17,500 persons in 1964.

The estimated casualties of 3,900 to 5,400 also can be related to the casualties inflicted by the Viet Cong on the civilian population of South Vietnam. In 1964, at least 1,800 South Vietnamese civilians were killed by the Viet Cong. An additional 9,500 were kidnapped; their fate is unknown. Through September 1965 the comparable figures are 1,400 killed and 9,000 kidnapped.

G. Evaluation of North Vietnam Propaganda Claims

The verification of propaganda claims of alleged destruction by US forces of civilian facilities in North Vietnam is conditional on receipt of adequate photographic coverage of military targets nearby* that have been struck

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Aerial photography of JCS-numbered targets was adequate to analyze 18 of 23 propaganda claims subjected to analysis. This analysis confirmed three claims. In the case of three additional claims the photography available for the location and date of the incident charged did not support the Vietnamese claim. Of the 12 other targets analyzed, 11 showed bomb damage outside the target area and 1 was tentatively identified as confirmation of a North Vietnamese claim.

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It is relevant to this entire question of the validity of propaganda claims to appreciate some of the deception measures adopted by the North Vietnamese.

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* Within a radius of 15 nm of the alleged destruction.

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The three charges confirmed are based on positive identification of the buildings and structures suffering bomb damage. A strike at the Vinh Supply Depot on 16 August 1965 indicated 32 buildings destroyed and 26 damaged outside the JCS target area but within the target complex. Much of this damage occurred as a result of flak suppression strikes in reaction to heavy and widely dispersed antiaircraft fire, a single case of target misidentification accounted for other off-target damage. The hospital was not identified but the technical school showed extensive bomb damage. One wing of the main building was completely destroyed and the entrance cratered. Three other buildings in the school complex were damaged. A dam on the Son Chu Canal was destroyed in bombings of 21-23 August as a recognized JCS target. In addition to destroying the electric power capacity and canal locks, a dike and the edge of the canal were cratered with consequent flooding of about 100 acres. The final confirmation is of civilian facilities in the city of Yen Bay, adjacent to the railroad classification yard. Although medical facilities could not be identified, a possible workers housing area sustained destruction of 14 buildings and damage to 10 others. Most of the damage sustained at Yen Bay was the result of unauthorized armed reconnaissance strikes at the railroad classification yard. The only authorized target was the Yen Bay ordnance depot. Steps have been taken to prevent further unauthorized strikes of this kind.

A considerable amount of propaganda has focused on an alleged strike on 12 June of a leper hospital, in the Quynh Lap District of Nghe An Province.

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Strikes on 12-17 June at the UNCODED indicated that of 117 buildings in the target area 50 were destroyed and 48 damaged. Although this target has not been identified as or associated with a leper hospital, its location resists a military identification but it does seem to be of an institutional nature. It is located on the Tonkin Gulf completely isolated from the neighboring coastline north and south and to the west by a continuous ridge of hills. The only exit is a road over the hills to the west and there is no evidence of a marine terminal at the facility. In addition, no defensive positions such as antiaircraft artillery or trench networks are evident. Since positive identification of its functions is not possible, and since it is apparently not a military installation it is considered probable that it is the leper hospital named in the charges.

The three JCS targets with available photography that showed no evidence of destruction outside the target area were the Chap Le Barracks, the Dong Hoi Citadel, and the Nam Dinh railroad/highway bridge. There is no evidence in aerial photography to support claims

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by the North Vietnamese of destruction of medical facilities in Dong Hoi. However, the practice of placing an identifying red cross on the side of rather than on the roof of medical buildings makes it impossible to identify hospitals or associated facilities in the available aerial photography. Armed reconnaissance missions striking at targets of opportunity, however, could easily strike an unmarked hospital.

The eleven other JCS targets which had unidentified bomb damage outside the target area could also include hospitals. Destruction to commercial centers and population areas is also difficult to identify because of the structural uniformity of North Vietnamese buildings, which tend to French designs in the cities and thatched huts in rural areas. At the Son La Military Complex, the village itself is within the military target area. There was no photography available for the time period during which North Vietnam claims destruction in the cities of Thanh Hoa, Ha Tinh, and Dong Hoi. The extent of bombing in Vinh outside the JCS target area, however, was much in evidence. Armed reconnaissance along route 1A, which runs through all these cities, could account for some of the damage. The following list provides details:

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No evidence of a hospital being hit. No Red Cross markings on DRV medical buildings. Extensive trench networks around buildings and active antiaircraft sites; 3 to 4 buildings damaged in spillover of Area S, storage and support.

25X5

Buildings burning just outside target area. Estimate 22 houses destroyed, 9 damaged, and 5 on fire. No evidence of hospital struck. No evidence

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25X5

Craters, but no evidence of hospital hit in target area.

25X5

One building superficially damaged outside target area. Not able to identify as a medic station.

25X5

Four buildings destroyed outside the target area. Hit a shrine.

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25X5

Housing damaged at bridge approaches -- 28 destroyed, and 30 damaged.

25X5

Two thatch roofed shacks destroyed near bridge approach.

25X5

Eleven buildings destroyed outside the target area, including nine farmhouses.

25X5

No buildings damaged adjacent to this target.

25X5

Not identified as a Leper Hospital but definitely of an institutional nature, and location contradicts military identification. On coast of Tonkin Gulf completely isolated from adjacent coastline north and south and to west by a continuous ridge of hills. One exit is a single road over hills to the west and no marine terminal exists. No defensive positions, that is, antiaircraft or trench networks are evident. Of 117 buildings in the target area, 50 are destroyed and 48 damaged. Outside the target area 6 were destroyed and 9 damaged.

25X5

No hospital identified. JCS target area not hit on 17 June. Two buildings destroyed and 15 damaged.

25X5

No hospital identified. Outside the target area but in the target complex are 59 buildings destroyed and 70 buildings damaged.

25X5

No coverage of adjacent area.

25X5

25X5

Outside target area 8 buildings destroyed, 1 large, possible TB sanatorium.

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25X5

No identity of hospital or medical service facilities. Adjacent to railroad classification yard, 14 destroyed and 10 damaged of possible workers' housing.

25X5

No coverage on date indicated.

25X5

Latest coverage 7 May, could have hit hospital on armed reconnaissance.

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Houses damaged,

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Outside JCS, but in target complex, 32 buildings destroyed and 26 damaged. Hospital not identified. Prestrike photography

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showed extensive damage outside the target area. Five buildings destroyed and eight damaged. Complex identified as technical school hit, one wing completely destroyed, entrance cratered, three buildings damaged in school complex.

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Considerable flooding of 100 acres. Dam not completely destroyed. Outside target area, six buildings destroyed and five damaged.

H. Methodology for Calculating Civilian Casualties Resulting from Air Strikes Against Fixed Targets

1. Calculation of Civilian Casualties in Rural Areas of the DRV*

Most of the civilian casualties inflicted on the DRV by assigned strikes in rural areas appear to have been caused by collateral bombing -- bombs falling off target and hitting adjacent villages.. In an effort to quantify the number of casualties resulting from such air action the following method was employed.

* Having a population density of 0 to 130 persons per square mile.

25X1

Three sample villages in rural areas adjacent to JCS targets were used for analysis. These villages were ranked in the following manner: (1) large village - 131 buildings; (2) medium village - 85 buildings; and (3) small village - 13 buildings. From photo analysis it was determined that initial strikes against the adjacent JCS targets caused the following physical damage: (1) 11 percent of the large village destroyed and damaged; (2) 13 percent of the medium village destroyed and damaged; and (3) 61 percent of the small village destroyed and damaged. In order to make use of the relative damage assessments, it was necessary to determine if the three size classifications for villages held any relationship with observed village sizes in the DRV. Analysis of available photos gave the following results:

Number of Buildings per Large Village	
	150
	121
	138
	120
Average	132

Number of Buildings per Medium Village	
	85
	98
	60
	87
Average	83

Number of Buildings per Small Village		
21	13	28
18	12	24
14	20	25
13	25	17
33	25	20
13	7	20
9		
Average		19

The 94 Target List was used to determine the size of villages, if any, located near JCS targets. The damage experienced in the three sample villages was then applied to the average number of buildings estimated for each village described in the JCS target.

Restrike damage was calculated in an asymptotic manner (that is, the number of casualties after the initial strike were halved for each restrike). Struck targets in unpopulated regions were assigned no civilian damage. Targets in areas with surrounding villages were assigned damage according to the scale given above.

To assign casualties to physical damage in the villages, three variables were considered: (1) JCS prestrike estimates of casualties against a specific target; (2) German experience with Allied bombing in 1943;

The final figures arrived at were four buildings destroyed and damaged for one casualty in rural areas.

	Large Village	Medium Village	Small Village
Average number of buildings	132	83	18
Number destroyed per village	10	8	4
Number damaged per village	5	3	7
Total per village	15	11	11
Percentage destruction			
Destroyed per village	7.6	9.6	22.2
Damaged per village	3.8	3.6	38.8
Total per village	11.4	13.2	61.0

2. Methodology Used in Calculating Casualties in Urban Areas

The city of Nam Dinh was used as a case study for the purposes of constructing a methodology for calculating casualties in urban areas. As a consequence of six air strikes, the casualties estimated for this city are a minimum of 30 and probably 45. The population of Nam Dinh is 90,000. Therefore, the casualties ranged from 1 per 18,000 in population to 1 per 12,000 in population.

In applying these findings to other urban areas, only two variables have been used. The first variable is the number of strikes, and the

second is the population of the various localities. These variables have been accounted for as follows:

Urban Area: X
Number of Strikes: 6
Population: 10,000

6 x 10,000 = 60,000
60,000 ÷ 18,000 = 3 casualties
60,000 ÷ 12,000 = 5 casualties

Examination of photography has shown that in the localities with less population, there has been relatively more damage to civilian-associated housing and activities. In addition, the smaller localities are believed to have received less perfect warning of air strikes and have less well-established civilian defense measures than a locality of the size of Nam Dinh. Furthermore, in the smaller localities civilian housing is less well constructed. Hence in the smaller towns, the building-damage method was used.

APPENDIX C

ESTIMATES OF PHYSICAL DAMAGE IN NORTH VIETNAM*

A. Economic

The economic losses caused by US/South Vietnamese air strikes in North Vietnam continue to increase, and the adverse effects of these losses are now spreading throughout the economy. The losses, however, still remain small in comparison with total economic activity because the country is predominantly agricultural and the major industrial facilities have not been attacked. The most important effects on the economy are: (a) difficulties in distributing food to local food-deficit areas; (b) production losses caused by diversion of skilled manpower and scarce materials from productive uses to the repair of damaged facilities; (c) disruption of normal work schedules because of the threat of air attack; (d) reduction of foreign exchange earnings because of the difficulty in moving export goods to port; (e) losses in agriculture attributable to damage to power stations and thus to irrigation capacity; and (f) problems in management and administration caused by the disruption and relocation of economic activity. The cumulative strains now show signs of becoming severe enough that aid from Communist countries will have to be stepped up if the economy is to meet both minimum civilian and military requirements. But economic deterioration so far has not affected the capabilities of North Vietnam's armed forces, which place little direct reliance on the domestic economy for materiel. The one exception -- movement of personnel, equipment, and supplies -- is being hampered by damage to transportation facilities.

Direct losses caused by damage to economic facilities and equipment is now estimated at almost $20 million. Measurable indirect losses amount to $12.5 million, mainly reduction in foreign trade and agricultural output. The direct economic losses that can be measured have fallen most heavily on the transportation sector of the economy. The cost of permanent reconstruction of railroad and highway bridges would be about $8 million, and the replacement or repair of destroyed or damaged transport equipment would cost an additional $4.3 million. The cost of temporary repairs to bridges would be about $1 million. Reconstruction of the damaged electric powerplants would cost about $4.5 million and the textile mill $1 million. Repair costs for the petroleum storage facilities are estimated at about $500,000. The growing loss of foreign exchange earnings -- now totaling $6.5 million -- is appreciable, although not yet serious. The growing losses from lower production throughout the economy can be quantified only in agriculture, where potential losses in fall rice crops and other disruption to normal farming will amount to about $6 million. The measurable costs of

* See Tables 1 and 2 for detailed information on the types and extent of military and economic damage.

Physical Damage Resulting from Strikes on Fixed Targets
Through 31 October 1965

Fixed Targets	Targets Struck: Number	Targets Struck: Percent of National Capacity [a]	Number of Attacks	Strikes/Sorties [b]	Percent of National Capacity Destroyed
Economic					
POL storage	4	21.6	7	90	16.7
Powerplants	5	13.5	15	133	13.5
Maritime ports	4	12.0	9	157	5.7
Railroad yards	1	7.0	5	75	5.2
Bridges	35		66	1,486	31 not usable
Locks	1		1	2	1 destroyed
Ferries	11		6	42	
Military					
Ammunition depots	12	69.7	51	1,108	33.6
Barracks	40	23.9	161	2,481	13.4
Supply depots	16	18.3	40	516	9.5
Explosive plant	1	100.0	3	28	28.0
Airfields	4		9	268	Runways cratered; 25% buildings destroyed at airfields attacked.
Naval bases	2		9	132	45% buildings destroyed at bases attacked.
Radar sites	13		21	270	3 destroyed, 4 damaged, 4 redeployed prior to attack.
SAM sites	9		9	75	2 possibly damaged, 1 destroyed, 2 not observed.
Communications installations	2		2	15	2 destroyed

a. Where appropriate.
b. Strike plus flak-suppression sorties.

Results of Armed Reconnaissance Program a/
2 February - 25 October 1965

Targets	Damaged	Destroyed	Total (Units)
Transportation vehicles			
Vehicles/trucks	398	287	685
Ferry boats	33	45	78
Boats, junks, craft	551	288	839 b/
Locomotive/rolling stock	495	178	673
Subtotal	1,477	798	2,275
Bridges/ferry landings			
Railroad/highway, railroad, and highway bridges	593	260	853
Ferry facilities	79	12	91
Subtotal	672	272	944
Small prebriefed targets			
Barracks	208	146	354
Buildings, supply, warehouses, miscellaneous	1,566	1,278	2,844
Radar communications sites c/	111	7	118
Truck parks c/	98		98
Antiaircraft sites c/	59	53	112
Subtotal	2,042	1,484	3,526
Grand total	4,191	2,554	6,745

a. Pilot reports account for a considerable percentage of the items reported destroyed and damaged, consequently the aggregate damage is obviously overstated.
b. Including those damaged or sunk.
c. Information as of 30 September.

reconstruction, replacement, and repair of damaged facilities, if attempted, would represent almost 20 percent of total gross annual investment in industry. In addition, North Vietnam is incurring additional costs for temporary expedients to compensate in part for the damaged facilities. Purchases of portable electric power generators, temporary bridging equipment, additional motor trucks, and small tanks and drums for the transportation and storage of petroleum are increasing far above normal levels. It is not possible at this point to estimate the value of these purchases.

The strains on distribution, manpower resources, and management capabilities created by the bombing are reducing domestic industrial performance and the effectiveness of Communist aid. Industry in the parts of the country affected directly by the bombing normally accounts for only about 20 percent of total gross industrial output and consists mainly of textile production, food processing, lumber and paper production, chromite mining, and processing of crude phosphate fertilizers. The economic losses sustained in the bombed areas are principally a consequence of the loss of electric power and disruptions to the transportation system. Hardships are severe in these parts of the country, and continuing shortages of food and equipment are hampering reconstruction efforts. Nevertheless the primarily rural nature of the area permits continued functioning of the subsistence economy. In the more economically important parts of the country there is explicit evidence of industry's failure to outpace the increasing disruption caused by the air strikes and the policies adopted as a consequence of them.

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The strains on distribution, manpower resources, and management capabilities have increasingly affected industrial production adversely. These strains resulting indirectly from the bombing are being compounded by implementation of plans to disperse industrial production in order to make industry less vulnerable to air attack and to reduce the requirement for transportation. The problems that are hampering North Vietnam's reconstruction efforts and that have reduced industrial output are also reducing the effectiveness of aid from Communist countries. Progress is being delayed in the completion of several economic development projects for which foreign aid is being received. Work is continuing on other major economic projects of the first 5-year plan (1961-65) and several additional projects have been started. Economic development, therefore, appears to be continuing, but it is no longer orderly and probably will be retarded significantly.

The bombings of the bridges on the Dong Dang - Hanoi railroad line apparently halted traffic only briefly, and the receipt of military equipment and economic goods from China by this route probably has not been significantly impeded. Through traffic on the Hanoi - Lao Cai railroad line has not resumed since this line was first bombed in mid-July. The railroads south of Hanoi remain inoperable for through traffic. In spite of the heavy damage to road bridges, substantial

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amounts of both economic and military traffic continue to be hauled by motor truck. The movement of all types of traffic on the waterways also appears heavy. The bombings have, nevertheless, created severe problems and have reduced capacity in all forms of transportation. Repair of the damage to the five electric powerplants has not progressed. The reduction of total generating capacity by about 14 percent continues to cause relatively minor curtailment of mining and industrial operations and loss of power for irrigation systems. Bulk petroleum storage facilities have been reduced in capacity by about 17 percent. There are localized problems in petroleum distribution and storage, but there is no overall petroleum shortage in the country. Priorities and alternate means of communication have had to be established in the telecommunications industry, and the effectiveness of postal service is continuing to decline. Food shortages continue to be reported as particularly serious in the southern provinces. Interruption of normal irrigation services in Thanh Hoa and Nghe An Provinces and interruption of usual farming practices will probably cause a reduction in the fall rice harvests. The volume of seaborne exports is declining, and there may be a lag of as much as 20 percent in planned exports by the end of the year.

B. Military

The recent pattern of air activity against North Vietnam continues to reflect a predominance of armed reconnaissance sorties, supplemented by air strikes against designated JCS targets. These operations have still not significantly reduced North Vietnamese capabilities to conduct defensive operations and to continue to furnish logistical support to the Communist forces in Laos and South Vietnam. While air operations have limited North Vietnam's freedom of movement, particularly in the southern provinces, there is no doubt that infiltration of men and materiel to the south continues. PAVN capabilities to launch and support a major offensive action into Laos and South Vietnam has been substantially curtailed, however.

The North Vietnamese are reacting to US air strikes by calling on Communist countries for material and technical support, by abandoning some facilities (air), and by redeploying forces (naval) from untenable locations. In addition, they appear to be effectively circumventing damage to barracks and supply and ammunition depots through dispersion and relocation of these facilities to concealed locales.

Although there are no indications that sustained air operations over North Vietnam have caused the regime to cease or desist supporting and directing insurgency in South Vietnam, the air activity is making such actions more difficult and costly for Hanoi. The application of pressure recently has placed emphasis on attacking bridges, while the far-ranging armed reconnaissance effort has aggravated problems by restriking targets which were previously attacked. In sharp contrast to an apparently lethargic response to attacks on airfields, barracks, and supply depots, the North Vietnamese have been

responding quite sharply to the interdiction of their lines of communications, particularly bridges. They have repaired many bridges and have resorted to using fords, ferries, pontoons, and floats, as well as earthen causeways.

Figure 1

Figure 2

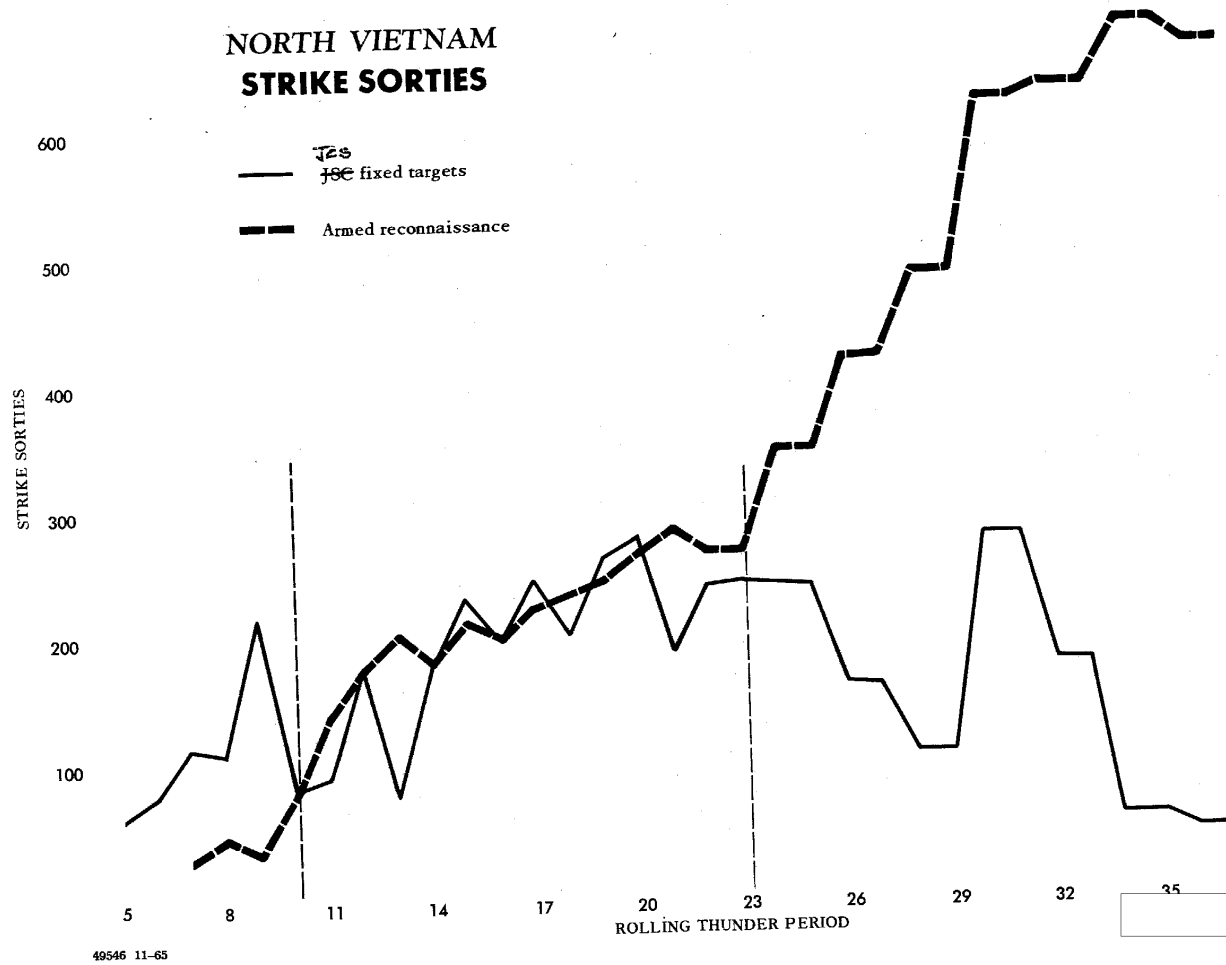

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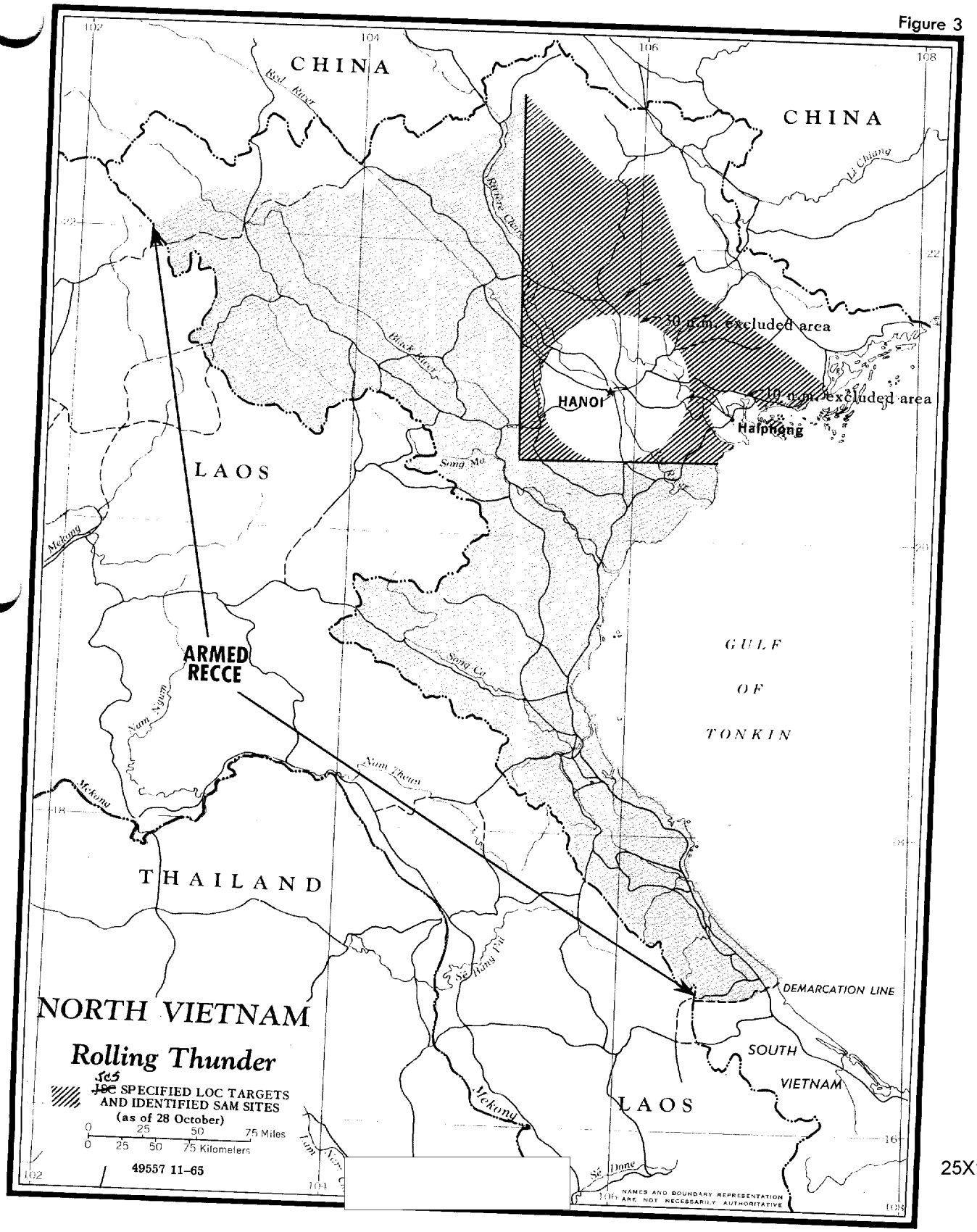
Figure 3



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